The Retirement Savings Puzzle Revisited

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SURVEY 44

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THE ROLE OF HOUSING AS A BEQUEATHABLE ASSET

Abstract

The so-called retirement-savings puzzle is a phenomenon by which, contrary to what the basic life cycle model predicts, households do not draw down their wealth significantly during retirement. In this survey paper we briefly review the literature that attempts to solve the retirement-savings puzzle. In addition, we review more extensively the literature on housing equity during retirement. To establish a link between the two bodies of literature, we use as a framework the work of Nakajima and Telyukova (2011), who find that homeownership interacts with factors that explain the retirement-savings puzzle, notably with the bequest motive. Additionally, we complement the results by Nakajima and Telyukova (2011), relating them to the literature on altruistic bequests, strategic bequests, and housing as a commitment device, all of which provide insights on the connection between homeownership and bequests. We complement our review of the literature with descriptive evidence using Dutch data, which in general suggests that the insights stemming from the literature are relevant for a better understanding of the situation in the Netherlands.

Policy recommendations

The ageing of the Dutch population is steadily putting financial pressure on the pension system as well as on the long-term care (LTC) insurance system. This already implies the need for changes in the direction of shifting the responsibility to finance these systems from the government towards the beneficiaries themselves. For example, the second pillar of the Dutch pension system is gradually shifting from a defined benefit scheme towards a defined contribution scheme. At the same time, as of January 1st, 2015, the Exceptional Medical Expenses Act (AWBZ) has been replaced by the Long-Term Care Act (WLZ), a change that implies cutbacks in the public provision of LTC as well as the inclusion of wealth holdings in the means test for eligibility. This situation raises great concern as to whether individuals are financially prepared to bear the costs that these changes imply.

In this context, policymakers as well as academics are looking into the potential of housing equity as a source of funds to finance both general consumption and LTC during retirement. In the Netherlands, housing represents a large share of the portfolio of retired households, and it is expected to be even more important in the future, since the generations currently in the pre-retirement phase of the life cycle are more exposed to housing than those already in retirement. For Dutch retirees, housing is estimated to represent nowadays about 40% of their net wealth, while this number exceeds 50% for households with individuals who are between 50 and 65 years of age. However, as we suggest in this survey paper, households are generally reluctant to use housing equity as a source of funds for consumption during retirement. Taking all of these elements into account, we propose a number of measures and caveats to combine the use of private

savings, including housing equity and other forms of wealth, with public assistance to guarantee the financial well-being of Dutch retirees in the years to come.

Facilitate the use of housing equity when a precipitating event occurs

The literature on the evolution of house equity during retirement points out that households generally do not plan to use housing equity as a source of funds to finance general consumption during retirement. In fact, there seems to be a tendency to regard housing as an asset to be bequeathed. Nevertheless, there is recurrent evidence showing that when a precipitating event occurs, the chances that a retired homeowner liquidates housing increases substantially. The literature identifies several of such precipitating events that trigger downsizing of housing equity. The most important are nursing home entry, widowhood, divorce and nest leaving by children. This suggests that housing is viewed as an asset that, in the best case scenario, is left as a bequest. However, on the one hand it serves the purpose of preventive buffer against adverse shocks (*e.g.* nursing home entry), and, on the other hand, it appears to be sensitive to family transitions (*e.g.* widowhood, divorce and nest leaving by children).

When a precipitating event occurs, the government should facilitate the drawdown of housing wealth for households who consider it to be necessary, as this will clearly improve their welfare.[1] For instance, when older homeowners experience nursing home entry, they may want to sell their house since, first,

1 We acknowledge that the welfare gain depends on the relative importance of housing equity in the total household portfolio. The literature recognizes that households that are house-rich and cash-poor are the most benefit the most from measures directed towards facilitating housing equity release. Any of these potential measures should take this into account.

it is not needed any more for housing purposes and, second, it can help finance their stay in the nursing home. Similarly, an older household that experiences a widowhood event might contemplate selling to move into a smaller accommodation (owned or rented), which can be coupled with the transfer of part of the bequest to the heirs. In situations such as these, the government can consider easing the transaction costs that such transitions imply. This might be done mainly in two ways: first, by exceptionally reducing for retirees the transaction tax households have to pay upon buying a house; and, second, by directly aiding retirees in the process of selling and/or searching for a new house or nursing home.

When evaluating the cost effectiveness of the two above mentioned alternative options, *i.e.* either reducing taxes or providing direct assistance, it should be considered that tax incentives also involve a cost since they imply a reduction in government revenues. Furthermore, manipulating tax rates typically implies unforeseen distorting effects. Therefore, tax cuts to incentivize certain types of behavior should always be implemented carefully, considering the cost in terms of lost revenues and the possible unwanted secondary effects that could imply misallocation of resources. This applies for the above mentioned measure referring to a reduction in the housing transaction tax, as well as for all the measures in this policy recommendations section that seek to foster certain behavior by means of tax incentives.

Stimulate the demand for releasing wealth locked in housing equity

Besides facilitating the drawdown of housing equity for house-holds who wish to do so as a consequence of a precipitating event

(which, as the literature points out, represent a small minority of households), government policy can also consider stimulating the demand for release of housing equity among households who have not yet considered it or who are not aware of this possibility. Stimulating this demand can be oriented towards the use of housing to finance general consumption, as well as towards increasing its use as insurance against adverse shocks and as a way to accommodate family transitions. This can be done through two main channels: the first involves facilitating housing equity liquidation through the development of new products, while the second implies informing the public at large about the possibility of using housing equity.

The first channel may consist of a range of different measures that can go from making existing ways to release housing equity more attractive, to the development of new housing equity release products. For example, it may consist of lowering housing transaction costs not only for those who experience a precipitating event, but as well through introducing basic measures that would apply to all retired households. In addition, special tax advantages can be considered as a way to stimulate the use of second mortgages and mortgage refinancing among retired homeowners who are in need of cash.[2] Regarding the development of new products, the introduction of reverse mortgages can be considered. The latter have never rooted so far in the Netherlands. Therefore, it might be helpful to relate them to LTC expenditures since, on the one hand due to the need of liquidity required to afford LTC, and on the other hand

2 The promotion of mortgage debt should be coupled with the enforcement of solid guarantees of repayment. The government and the banks should ensure that an increase in this type of debt, meant for older homeowners who want to liquidate housing equity, does not imply an increase in systemic risk due to excessive debt.

due to the reduced life expectancy of those in need of care it can be a realistic way to initiate a market for reverse mortgages. Furthermore, it can be of help to consider reverse mortgages that fully cover against longevity risk, *i.e.* that provide a stream of payments for as long as the household lives, since the reverse mortgages that have been tested so far in the Netherlands did not provide such a feature.

The second channel may consist of measures ranging from promoting financial literacy, with a stress on the uses of housing equity, to informing the public in detail about the different instruments that can be used to liquidate housing equity. For instance, the use of second mortgages and mortgage refinancing as a way to tap housing equity is an option that is available in the Netherlands and that can easily be publicized by the government and the banks. As to reverse mortgages, the literature shows that the Dutch public at large is mostly ignorant about what these are and what can they can be used for. More precisely, a recent survey reveals that only one out of every ten homeowners in the Netherlands knows what a reverse mortgage is. Therefore, a campaign to provide basic information can be useful to generate interest, stimulate demand, and, in that way, help the market get started.

Stress the use of using reverse mortgages as a way to time bequests

The literature on housing equity after retirement and the documented descriptive evidence for the Netherlands suggest that the role of housing as a bequeathable asset is relevant to under- stand the saving patterns of Dutch retirees. One important implication of a strong bequest motive related to housing is that it reduces the market niche for reverse mortgages, since the latter

imply that the house becomes property of the bank once the household decides to move or dies. In such a context, it seems difficult to kick start a market for reverse mortgages that could benefit a non-negligible share of retired homeowners who do not intend to bequeath part or all of their assets.

A plausible solution to this problem is to market reverse mortgages as an instrument that, besides helping provide liquidity for general consumption and LTC expenses, can provide a way to optimally transfer the bequest to the heirs. Given the recent increases in life expectancy, individuals nowadays are likely to receive bequests at an increasingly advanced age, which might not be the preferred option. For example, an optimal period in life to receive a bequest would typically be around the ages between 30 and 40, when family building and house purchase are more likely to take place nowadays. However, due to the rise in longevity, people are increasingly likely to receive a bequest around the ages between 50 and 60, when the need for financial help is likely to be smaller.

A reverse mortgage can potentially represent a solution to this problem, since it would allow parents to transfer the bequest to the heirs at any time that they wish, without having to move out of their main residence. As an alternative to a lump sum transfer at a particular point in time, a reverse mortgage would instead allow for the liquidation of the housing asset to translate into a stream of periodic inter-vivos transfers over time. In summary, reverse mortgages can provide more flexibility in the timing of bequests, which would result in benefits for both the parents and the heirs. Taking this aspect into account may help kick start the market for reverse mortgages, which would ultimately be beneficial for both households with and without a bequest motive.

Couple tax incentives to inter-vivos transfers with an income test for LTC eligibility

In line with the recommendation to market reverse mortgages as a way to time bequests, it is also worth fostering inter-vivos transfers by favoring their tax treatment relative to bequests. At the moment, inter-vivos transfers are treated for tax purposes in exactly the same way as bequests, *i.e.* a progressive tax levied on the beneficiary's share of the transfer that depends on the relationship between the giver and the recipient, with spouses and children, siblings, and others being subject to tax rates ranging from lower to higher respectively. Considering the relevance of the bequest motive, fostering inter-vivos transfers by lowering taxation relative to bequests can help optimize the timing of bequests for the reasons already mentioned in the previous policy recommendation.

The problem with such a measure is that it can have negative side effects due to the recently introduced wealth test for the determination of eligibility to publicly provided LTC. Since the 1990s, eligibility to such provisions was essentially needs-based coupled with co-payments dependent on income. With the new regime, the recipient's wealth is also considered when determining the amount of the co-payment. Therefore, decreasing taxes on inter-vivos transfers can have an unwanted side effect, in the sense that it may create an incentive for retired households to draw down their wealth by passing it on to their children and, in that way, become eligible for LTC.[3] Taking this caveat into account, it would be prudent to only consider tax advantages for inter-vivos transfers if coupled with an income test and not a wealth

3 The wealth test does not include the main residence. Therefore, introduction of reverse mortgages as a way to optimize the timing of bequests would not imply the negative side effect mentioned here.

test. In the case of retired households, the use of an income test has an additional benefit, namely that pension income is a good proxy for permanent income: compared to wealth holdings it is a better indicator of whether a person has enough lifetime resources to afford LTC expenses during retirement or not.

An alternative way to tackle the negative side effects of favoring inter-vivos transfers can be the introduction of a review period, as already introduced in the US in relation to Medicaid provisions. It consists of extending the wealth test to a specific number of years (five in the US) preceding the moment when LTC is requested. If a household transferred wealth to its offspring during such period, this would imply a penalty when calculating the co-payment required for LTC provision. This measure would prevent households from drawing down their wealth by transferring it to their children for the purpose of becoming eligible for public coverage of LTC. Furthermore, it would make the system more equitable since it would treat people with the similar lifetime income, but with different preferences when it comes to saving (either for a bequest or for precautionary reasons), in the same way.

Promote the intergenerational exchange of bequests for informal LTC provision

An additional way to counteract the decline in generosity of the pension and the LTC insurance systems is to foster the provision of informal care within families for those who can afford it. In the Netherlands, a person who takes care of a family member, a friend or a neighbor can apply to be considered as a care giver, in Dutch *mantelzorger*. If the status is granted, and the care giver is a first degree relative of the care receiver, *i.e.* offspring, parent or sibling, then they can become partners for the inheritance tax. This partnership means that the care giver will enjoy lower inheritance

taxes on the bequest that he/she will receive from the dependent family member when the latter dies.

The literature on bequests and the documented evidence for the Netherlands indicate the existence of a strategic bequest motive. In other words, there are retirees who use the bequest as a way to incentivize provision of services by the heirs. Such retirees have an incentive to use the house as a bequest, since it is a visible as well as illiquid asset that can easily be used to signal that a bequest will come. The existence of such a bequest motive indicates that there are grounds to extend the benefits for care givers to promote informal care to a larger extent, which can help counteract the recent cutbacks in the public provision of LTC.

Nowadays, the partnership for the inheritance tax is only granted if the care giver and the dependent person live in the same house. The government might consider relaxing this condition, by either allowing family members who do not live in the same house to apply for the partnership and/or by giving extra benefits to informal care givers, thus fostering the use of bequests (in the form of housing equity and/or other wealth components) as an incentive for the recipients to provide informal LTC. The final outcome of this measure would be similar to promoting the use of housing equity to finance LTC, with the difference that it would not imply liquidating the house, but leaving it as a bequest in exchange for the provision of informal care. As a word of caution, any measure in this direction should take into account that providing informal care may considerably disrupt the income earning ability of the provider. Therefore, the cost in terms of lost earnings should be considered when determining the compensation to the care giver.

Earmark inheritance tax revenues for LTC-related expenses

Due to the presence of a bequest motive related to housing and considering the attachment that retirees have to their own house, it may well be that relying on the withdrawal of housing equity through different means is not enough to counterbalance the changes in the pension system and the public LTC insurance system. In such a scenario it may be advisable to introduce a clearly progressive tax on the housing equity portion of bequests. The revenues generated can then be earmarked for expenses related to the LTC of retired individuals. This would complement the financing sources of the LTC public insurance system, which currently consist of mandatory insurance premiums and a small portion of funds from the co-payment scheme.

Such a measure can have several benefits. First, it can represent a source of stable funds to finance part of the coverage of long term care that the Dutch government still provides under the new regime. Second, it can help give to an important share of the aggregate private wealth stocked in the form of housing an adequate use in the present context of declining generosity of pension and public LTC systems. In fact, this measure would ultimately be similar to nudging households into liquidating their housing equity to finance LTC expenses. Third, this measure would serve to uphold the redistributive feature of the pension system, which would be lost if the pension and public LTC systems were to be completely substituted by a system that relies solely on private savings. The main problem of such a measure is that individuals may try to bypass it by leaving bequests in more liquid forms of wealth. However, this would imply an incentive to liquidate housing during retirement, which in itself is not necessarily a problem since it would allow assigning every euro of liquidated housing wealth to its most preferred use.

1. Introduction

The stripped version of the life cycle model (without uncertainty and without the bequest motive) predicts that households accumulate wealth throughout working life and decumulate it during retirement to support their consumption (Ando and Modigliani, 1963). However, a large body of evidence points to the fact that older adults usually decumulate wealth at a slower pace than predicted by the basic life cycle model (Poterba *et al.*, 2011). This phenomenon is known as the retirement-savings puzzle (RSP). In the present context of economic crisis and population ageing, the sustainability of public pension systems is under pressure. Thereby, it is relevant to study the underlying motives behind the RSP, since it is a key element for understanding whether people are financially prepared to face a decrease in the generosity of pension systems. In this survey paper, we review the literature on the RSP, focusing specially on the role of housing as a bequeathable asset, which we argue to be an important element towards understanding the RSP.

This survey paper starts out by briefly reviewing the general literature on the RSP. This literature can be classified according to the explanations given to solve the puzzle. We distinguish three main explanations: lifetime uncertainty, the bequest motive, and uncertainty regarding medical expenditures. Even though the evidence on the motives we discuss is rather mixed, depending on the context and after controlling for the relevant factors, they all appear relevant enough to be considered meaningful additions to the basic life cycle model. Parallel to the RSP literature, there is a body of literature that studies the evolution of housing equity during retirement (HER). Since housing equity is usually a very significant component of household portfolios, we pay special

attention to this literature and thus review it in greater depth. The general conclusion of the HER literature is that homeowners are generally reluctant to draw down their housing equity during retirement. However, most studies conducted so far are rather descriptive, and the link with the RSP literature is generally missing. Therefore, this paper aims at emphasizing the connection between these two bodies of literature.

The RSP literature and HER literature come together in the recent work by Nakajima and Telyukova (2011), who introduce a model of retirement savings with housing. The model constitutes an extension to the previous work by De Nardi *et al*. (2010), who consider a model for single retirees which includes lifetime uncertainty, bequests and uncertain medical expenditures. The addition by Nakajima and Telyukova (NT) consists of extending the model to couples and analyzed the housing asset separate from other assets in the portfolio, which turns out to have crucial consequences for the understanding of the RSP. The main conclusion stemming from their work is that homeownership interacts with factors that explain the RSP, notably with the bequest motive. We review the NT model in depth and complement it with additional literature that contributes towards understanding of the link between homeownership, bequests, and the RSP. The extensions that we consider are altruistic bequests, strategic bequests, and housing as a commitment device.

We complement our review of the literature with descriptive evidence for the Netherlands. To that end, we rely on data from the Dutch National Bank Household Survey (DHS), an internet-based panel survey run by CentERdata, an institute based at Tilburg University that collects data on economic, financial and psychological aspects of household behavior. It collects

data for around two thousand Dutch households every year between 1993 and 2014. We mostly use the last ten waves, which provide a recent and large enough sample for our purposes.[4] The evidence that we present generally supports the idea that, in the Netherlands, the role of housing as a bequeathable asset is potentially an important factor to understand the underlying causes of the RSP. Since we rely on correlative evidence, we cannot entirely establish whether the causality runs from the bequest motive to homeownership or vice versa. Nevertheless, we can say that the housing asset is an element that definitely needs to be considered when studying bequests.

The paper is structured as follows. Section 2 reviews the RSP literature, which we classify according to the explanation given for the puzzle. Section 3 reviews the HER literature, which we classify according to the origin of the data, *i.e.* US studies, international studies, and Dutch studies. Section 4 summarizes the NT model. Section 5 explores the relationship between homeownership and bequests by using the DHS data. Section 6 complements the NT model with a review of the literature on alternative bequest motives, *i.e.* altruistic bequests and strategic bequests. Section 7 complements the NT model by reviewing the literature on housing as a commitment device. Section 8 closes the paper with a short conclusion.

4 Households without a computer and/or access to the Internet were provided with a basic computer and Iinternet connection to complete the survey. Attrition is dealt with by refreshing the sample every six months with new households to keep the panel representative of the Dutch population. High income households are slightly overrepresented. Therefore, for all results presented in this paper, we employ sample weights provided by CentERdata, which take into account unequal selection probabilities.

2. The retirement-savings puzzle

The literature on the retirement-savings puzzle (RSP) shows that households generally do not reduce their wealth during retirement in the way the basic life cycle model suggests. Additionally, it attempts to determine the reasons behind this phenomenon. Poterba *et al*. (2011) and Van Ooijen *et al*. (2015) provide thorough reviews of this literature. In this paper we confine ourselves to a brief summary, which we use as a stepping stone for the rest of the paper.

Most of the literature on the RSP can be classified into three branches according to the explanation given as a key to solve the puzzle. First, there is a branch of the literature, initiated by Yaari (1965), which investigates the role of lifetime uncertainty as an explanation for the RSP. Recent contributions to this literature are De Nardi *et al*. (2009), Cocco and Gomes (2012) and Post and Hanewald (2013). A life cycle model without lifetime uncertainty implies that households are perfectly aware of their time of death. Therefore, they can plan with full accuracy to gradually draw down their wealth so that it is fully depleted by the time they die. With lifetime uncertainty in the model, households do not have full certainty about their time of death, and thus they generate an expectation about it. If households die earlier than expected, their wealth will not be totally depleted, leading to involuntary bequests. On the other hand, the risk of outliving their net worth induces households to deplete their wealth more slowly compared to the case without lifetime uncertainty.

Second, there is a branch of the literature, initiated by Becker (1974), Bernheim *et al*. (1985) and Hurd (1989), which explores the role of voluntary bequests as an explanation for the RSP. More recent contributions include Laitner (2002), Kopczuk and

Lupton (2007), and De Nardi and Yang (2014). In the basic life cycle model, households aim at dying with zero wealth. Introducing a bequest motive implies that they derive utility from dying with positive net worth, which flattens the wealth trajectory during retirement. Kopczuk and Lupton (2007) classify the literature according to three types of bequest motive: the *egoistic* motive (Hurd, 1989; De Nardi and Yang, 2014), in which households leave a bequest simply to increase their own utility; the *altruistic* motive (Becker, 1974; Laitner, 2002), in which the utility of the recipient plays a role in determining the bequest; and the *strategic* motive (Bernheim *et al*., 1985; Perozek, 1998), in which, besides being altruistic, older adults use the bequest to strategically influence the quantity of services provided to them by the recipients. In addition to intentional bequests, there is a related branch of the literature that focuses on inter-vivos transfers (*e.g*. Cox, 1987; Norton and Van Houtven, 2006; Hochguertel and Ohlsson, 2009; and Alessie *et al*., 2010), which are expected to affect the saving behavior of older adults in a way similar to the bequest motive. Third, there is a more recent branch of the literature (*e.g*. Palumbo, 1999; Coile and Milligan, 2009; De Nardi *et al*., 2010; and Dobrescu, 2015) that considers the role of uncertain out-of- pocket medical expenditures (OPME), *i.e*. non-insured medical expenses, as an explanation for the RSP. The basic life cycle model does not include health as a determinant of saving and consumption. The introduction of the health status allows for considering the role of uncertainty regarding OPME. The basic idea is that, depending on age, health status, and a stochastic term, households face a risk of incurring medical expenditures. If they are unable to obtain full insurance against this risk, they will engage in precautionary saving, thus retaining a buffer stock of savings that will flatten the wealth trajectory during retirement.

Even though the empirical evidence on the different explanations discussed in this section is rather mixed, depending on the context and after controlling for the relevant factors, they all appear relevant enough to be considered meaningful additions to the basic life cycle model. However, note that the different explanations are not necessarily incompatible. It may well be that households rank them according to their preferences. In such case, the unfolding of exogenous events will crucially determine which purpose is eventually assigned to the savings of a retired household.

3. Home equity in retirement

Parallel to the literature on the retirement savings puzzle (RSP), there is a stream of literature that studies the evolution of housing equity during retirement (HER). Housing is an asset that deserves special attention due to its dual role as consumption and investment good, and due to its associated transaction costs, which make adjustments in housing rather infrequent. Furthermore, it is very often the most important asset in a household portfolio. This is the case in the Netherlands, where during the past several decades homeownership has increased substantially, which appears to remain high as households enter retirement.[5] Table 1 shows that, according to DHS data, among three cohorts of Dutch households above 60 years of age, homeownership and the ratio of housing equity to total net worth are rather high and have not significantly changed during the last five years of the survey, *i.e.* from 2010 to 2014. Furthermore, Table 1 suggests that there are relevant cohort effects indicating that younger generations gradually rely more on housing in their portfolios.

In general, the HER literature aims at answering the question of whether retirees regard housing equity as a source of funds for general consumption. According to Venti and Wise (2004), answering this question is important for two reasons. First, it can help assess the potential demand for releasing the wealth locked in illiquid housing, which has implications for the development of financial products such as reverse mortgages. Second, it contributes to understanding the adequacy of saving

5 According to the OECD, the Netherlands experienced during the 1990s and early 2000s the largest increase in homeownership among OECD countries (Andrews and Caldera-Sanchez, 2011). According to DHS, the homeownership rate in the Netherlands stood at 57.48% in 2014.

Table 1. Homeownership and housing wealth among older adults

	Homeownership rate			Housing equity over net worth		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
2010	62.71%	52.50%	50.22%	43.48%	38.12%	36.70%
2011	60.12%	49.89%	49.60%	41.81%	37.74%	36.02%
2012	61.56%	53.29%	53.02%	40.50%	36.39%	35.22%
2013	60.39%	53.53%	51.94%	40.65%	37.96%	35.81%
2014	58.60%	56.57%	47.87%	39.09%	36.85%	34.07%

Source: DHS. Cohorts 1, 2 and 3 include households with household heads aged 60 to 64, 65 to 69 and 70 to 74 in 2010. The second panel provides the average share of housing equity (*i.e.* house value minus remaining mortgage debt) over total net worth (assets minus liabilities) of households.

for retirement. If financial wealth and housing wealth are used interchangeably to finance consumption, then the latter might as well be given the same treatment as financial wealth when evaluating whether households save enough for retirement.

3.1 US studies

One of the first to tackle the question of whether retirees use housing equity to fund general consumption were Venti and Wise (1990). Using the Retirement History Survey (RHS), they find that on average older adults who move do not downsize their housing equity. They conclude that older adults are in general not willing to use housing equity for consumption. On the contrary, Sheiner and Weil (1992) find, using the Panel Study of Income Dynamics (PSID), that average levels of homeownership among older adults decline significantly with age and conclude that housing wealth is used for consumption. However, even though the results are statistically significant, their economic significance is questionable since the observed decline in homeownership is rather limited. Hurd (2002) confirms, using a panel data set derived from the

Asset and Health Dynamics among the Oldest Old (AHEAD), a modest decline in housing wealth and homeownership rates among older adults. In addition, he points out that households experiencing a health shock or a widowhood event display larger declines in housing equity and are more likely to terminate homeownership.

Following on the work by Hurd (2002), Venti and Wise (2004) perform a comprehensive analysis of the evolution of housing equity during retirement, paying special attention to the effect of precipitating events, *i.e.* widowhood and nursing home entry. They combine the Health and Retirement Study (HRS) with the AHEAD survey and consider two ways by which homeowners can change their housing equity: by discontinuing homeownership or by selling and moving to a newly purchased residence. By means of cohort specific analysis, they find that households who experience a widowhood event or nursing home entry display considerable declines in homeownership and in housing equity, while for households who do not experience any of these events housing equity remains almost intact throughout retirement. Overall, they find that older adults are rather unlikely to move or to terminate homeownership.[6] They conclude that housing equity is generally not used for consumption. This has two implications: first, the demand for reverse mortgages is low, and, second, housing wealth should not be counted when assessing retirement savings, since it is not interchangeable with financial wealth. Instead, it might be appropriate to think of housing equity as a consumption good that, at the same time, provides a preventive buffer for adverse shocks.

6 Venti and Wise (2004) do find a very slight decrease in housing equity among the oldest households (75+) that do not experience any precipitating event. However, they attribute this to depreciation of the housing asset, which can actually be considered to be a form of housing equity withdrawal.

In contrast to Venti and Wise (2004), Sinai and Souleles (2007) study the evolution of housing equity in retirement but do not consider homeowners who move. Instead, they look at homeowners who stay in the same residence, and study how they react to the remarkable increase in house prices experienced in the US market between 1983 and 2004. Using the Survey of Consumer Finances (SCF), which provides repeated cross sections over time, they report that households, especially the youngest among older adults, have offset the rise in housing equity by increasing their housing debt through housing equity loans. However, they point out that the offset effect is rather small and that it could be larger if there were fewer restrictions to borrow against housing wealth. Contrary to Venti and Wise (2004), Sinai and Souleles conclude that households are potentially willing to liquidate housing wealth to finance consumption. Therefore, only the percentage of housing wealth that cannot be borrowed against should be considered as not interchangeable with financial wealth.

3.2 International studies

Moving away from strictly US-based studies, Banks *et al*. (2012) compare downsizing among retirees in Great Britain and in the US. Their work is similar to Venti and Wise (2004) in the sense that they focus on households who move to a new location. The analysis is based on data from PSID for the US and from the British Household Panel Survey (BHPS) for Great Britain. They find that, upon moving, British older adults downsize more than Americans. However, the percentage of older households who actually move is much higher in the US. As a consequence, considering the entire population above retirement age, more downsizing takes place in the US compared to Great Britain, even though in both countries

the vast majority of older households do not actually move. These comparative results hold when controlling for marital status, family size, and employment transitions. Additionally, Banks *et al*. focus on studying the factors that explain the difference in mobility. They conclude that it is a mix of geographical factors (in the US there is more climate diversity and variation in environmental amenities) and institutional factors (in Great Britain there are more transaction costs due to taxation of home sales) that explains the higher percentage of moving households in the US. These results suggest that, in Europe in general, moving house during retirement may be less popular than in the US due to higher institutional restrictions and less variation in tax regimes and geographical amenities within countries.

Among the very few fully international studies, Chiuri and Jappelli (2010) use data on15 OECD countries, while Angelini *et al*. (2014), in the only Europe-wide study so far, use data on 13 European countries. The former employ data from different country-specific surveys, which allow them to construct a data set of repeated cross-sections over time. They look at the cross-sectional relationship between homeownership and age, and find that homeownership rates decline considerably after age 60. However, after controlling for cohort effects, the decline becomes much more moderate, not starting until after age 75. In addition, they find that cross-country variation in terms of institutions, such as tax regimes and mortgage market regulations, have an impact on the degree to which housing wealth is withdrawn during retirement. On the other hand, Angelini *et al*. (2014) use life history data from the Survey of Health, Ageing and Retirement in Europe (SHARE) and, similar to Venti and Wise (2004) and Banks *et al*. (2012), study the behavior of homeowners and renters who move. Even though they assert that moves are rare all over Europe,

they are likely to happen when there is a precipitating event, *i.e.* divorce, widowhood and nest-leaving by children. In addition, they also find after controlling for country characteristics and family transitions, that economic reasons may play a role, since retirees who are cash-poor and house-rich are the most likely to downsize their housing asset.

3.3 Dutch studies

Narrowing the focus to the Dutch case, Van der Schors *et al.* (2007) employ data from the Dutch Social Economic Panel (SEP) for the period 1990-2002 and find a strong negative cross-sectional relation between age and homeownership among Dutch households. However, a detailed analysis indicates that this age gradient is mostly due to cohort effects. They find that higher lifetime income due to long-term productivity growth is the main factor that explains generational effects in homeownership among older adults. In addition, they find that changes in the supply of housing and relaxation of the requirements for obtaining a mortgage loan also play a role in explaining why younger generations of older adults display higher homeownership rates. This evidence has recently been confirmed by Van Ooijen *et al.* (2015). They describe the saving behavior and the portfolio choice of Dutch retirees by using high-quality administrative data for the 2005-2010 period. Like Van der Schors *et al.* (2007), they find strong differences between cohorts. However, both homeownership rates and the amount of housing equity held by older households do not appear to decline significantly with age.

In a different study, De Graaf and Rouwendal (2012) investigate whether older Dutch house- holds liquidate housing wealth by increasing their mortgage debt or taking a second mortgage. Using data from the WoningOnderzoek Nederland (WoON) survey

for the 1985–2009 period, they find that older adults, even though they may not have completely repaid their mortgage, do not increase their mortgage debt, not even when house prices increase at considerably high rates. They consequently conclude that the vast majority of older homeowners do not use mortgage debt to decumulate housing equity. More recently, Dillingh *et al*. (2015), investigate a similar issue by conducting a survey on the psychological and economic aspects of reverse mortgage attitudes of homeowners in the Netherlands. They explain to respondents what a reverse mortgage is and then ask to what extent they might be interested in such a product.[7] Even though they are optimistic about the potential demand for reverse mortgages, only 6% of respondents show clear interest, while 21% show moderate interest. However, given the evidence in De Graaf and Rouwendal (2012) about second mortgages, it is doubtful that many of these respondents would actually purchase a reverse mortgage in practice.

The findings by Van der Schors *et al*. (2007) and Van Ooijen *et al*. (2015) agree with the evidence in Table 1, which shows clear cohort effects. Table 2 takes the analysis a step further by showing that, according to DHS data, most Dutch older households do not move. Only about 7% of the households above 60 years of age interviewed between 2005 and 2014 reported to have moved.[8] Among those who move, less than half (about 37%) do it to

7 A striking fact about this survey is that only 9% of respondents declare to know what a reverse mortgage is.

8 Note that the panel we are using is not balanced and thus many households are not interviewed over the full ten-year period. In fact, only 16.74% of all households interviewed between 2004 and 2014 are followed throughout the whole period. This means that the time frame in which we know whether a household moved or not is heterogeneous. The percentage of respondents who report to have moved could differ if all households were observed over the full ten-year period.

Table 2. Housing moves among older adults (2005–2014)

Total older households interviewed	1,441	
Registered moves	109	100%
Rent-to-own	4	3.67%
Own-to-rent	25	22.94%
Own-to-own	28	25.69%
Downsize	15	13.76%
Upsize	13	11.93%
Rent-to-rent	52	47.70%

Source: DHS. Older households are defined as households with a household head who is 60 or older. The survey does not capture nursing home entries. This table contains information on all of the 60+ households interviewed between 2005 and 2014. The panel is not balanced, hence the time frame in which we know whether an interviewed household moved or not is heterogeneous.

Table 3. Willingness to use housing equity (2005–2014)

	Certainly yes	Probably yes	Probably not	Definitely not	Do not know	N of obs.
Full sample	2.32%	4.03%	34.39%	56.56%	2.70%	9,469
Older households	2.15%	4.25%	31.93%	59.68%	1.99%	3,956

Source: DHS. Households were asked: "Are you planning on using the surplus value of your property in the next two years (by taking out an extra mortgage, by increasing your mortgage amount, or by moving)?".Older households are defined as households with a household head aged 60 or older.

downsize their housing asset either through own-to-rent or own-to-own transitions. In addition, Table 3 shows that Dutch households generally do not plan to use their housing equity, which could be done by either moving, taking out an extra mortgage, or increasing the amount of the present mortgage. The results in Table 3 support the findings by De Graaf and Rouwendal (2012) and do not leave much room for optimism regarding the potential demand for reverse mortgages in the Netherlands. The

evidence in Tables 1 to 3 is in line with the findings by Suari-Andreu (2015), who, using the same DHS dataset employed in the present study, reports that Dutch households of all ages do not compensate house price declines by increasing their savings. This type of behavior suggests that Dutch households do not plan to tap their housing equity during retirement to finance regular consumption.

Summarizing, even though the evidence provided by the HER literature surveyed in this entire section appears to be somewhat mixed, a general conclusion can be drawn that older households do not usually withdraw housing equity during retirement. However, the HER literature is mostly descriptive, and the link with the RSP literature is rather limited. Therefore, the next step is to ask why housing equity is not withdrawn. Is it because of lifetime uncertainty? Is it because housing wealth is used as precautionary savings? Or is it because housing is regarded as an asset to be bequeathed? While these questions are crucial for policy-setting and for the understanding of the RSP, the HER literature summarized in this section is generally descriptive and does not tackle them directly. In the next section we therefore introduce a theoretical framework that aims at tackling these questions. By doing so, it connects the HER literature with the literature on the RSP discussed in Section 2.

4. A model of retirement savings with housing

The two streams of literature outlined in Sections 2 and 3 come together in the work by Nakajima and Telyukova (2011), who argue that the retirement-savings puzzle (RSP) cannot be solved without emphasizing the role of the housing asset. Using HRS data, Nakajima and Telyukova (NT) find that the post-retirement evolution of assets shows a very different picture for homeowners compared to renters: while the former do not draw down their wealth during retirement, the latter do, which suggests that homeownership interacts with factors that explain the RSP. These insights are of clear potential importance for explaining the RSP in the Netherlands, where, as shown by Tables 1, 2 and 3, it is very likely to be driven by the lack of housing equity withdrawal during retirement.

NT are the first to study housing equity in retirement in the context of a structural life cycle model, similar to the ones employed in the RSP literature. The model constitutes an extension to the previous work by De Nardi *et al*. (2010), who consider a model for single retirees which includes lifetime uncertainty, bequests, and uncertain medical expenditures. The addition by NT consists of extending the model to couples and analyzing the housing asset separately from the rest of the portfolio. This turns out to have crucial consequences for our understanding of the RSP. In this section we explain the NT model in detail and the results obtained when estimating its parameters using HRS data. Furthermore, we propose several extensions to their framework: altruistic bequests, strategic bequests, and housing as a commitment device.

4.1 Utility function

In the NT model, every household is born as a retiree at age $i = 1$ and potentially lives up to age I. In every period, the household chooses consumption, saving and housing such as to maximize remaining lifetime utility, which is time-additive. The within-period utility function has the form:

$$V(c,h,b,o,s) = s\frac{\left(\frac{1}{\mu_s}c^{\eta}(\omega_o h)^{1-\eta}\right)^{1-\sigma}}{1-\sigma} + \gamma\frac{(b+\zeta)^{1-\sigma}}{1-\sigma}, \qquad (1)$$

where the first term captures the utility derived from consumption and housing, while the second term captures the utility derived from leaving posthumous wealth as a bequest. In the first element, c is (non-housing) consumption, h is consumption of housing services, s is the number of adults in the household, the subscript o is the tenure status, with $o = 1$ indicating owner and $o = 0$ indicating renter, μ_s is the effective household size, ω_o captures the extra utility from owning a house,[9] $0 \leq \eta \leq 1$ is a parameter capturing the relative weight of non-housing consumption versus housing services, and $\sigma \geq 0$ is the coefficient of relative risk aversion. In the second element in (1), b is posthumous wealth, $\gamma \geq 0$ captures the strength of the bequest motive, and $\zeta \geq 0$ is a parameter determining the extent to which bequests are luxury goods.

Regarding the first element in (1), there are two relevant features worth mentioning. The first is that utility is non-separable in consumption and housing, which allows for the marginal utility of consumption to be positively dependent

9 NT set $\omega_0 = 1$, while $\omega_1 > 1$.

on housing, *i.e.* $\partial u(\cdot)/\partial c = f(h, c)$ and $\partial f(h, c)/\partial h > 0$. The intuition is that the quantity of housing services consumed, which is assumed to increase linearly with the size of the house, increases the marginal utility derived from an additional unit of consumption. The second relevant feature refers to the way couples are modelled. NT follow the unitary assumption, implying that both members of a couple have the same utility function and that consumption is split equally between the two. However, each member enjoys more than half of the consumption flow because of the returns to scale within couples, captured by the *household size multiplier*, given by $s/\mu^{1-\sigma}$.[10]

As indicated by the second element in (1), in addition to the utility derived from consumption and housing, a household gains utility from leaving a bequest once all of its members have died. A bequest consists of all of the wealth that is left behind after death; which includes the house if the household dies as a homeowner. Similar to Hurd (1989), Kopczuk and Lupton (2007), and De Nardi *et al*. (2010), NT assume that bequests follow an egoistic motive, since the utility derived from leaving a bequest does not depend on the utility of the recipient. Furthermore, there is no room for bequests to be used strategically as compensation for services provided by the recipients.

4.2 Housing

For a homeowner, the housing decision consists of two options: staying in the present residence or becoming a renter. For a renter the only housing choice is the size of the rental property. Own-to-own and rent-to-own moves are assumed away by NT due to their

10 NT assume that $\mu_1 = 1$ and $\mu_2 \in \{1, 2\}$, which implies that the household size multiplier for a single is $1/\mu_1^{1-\sigma} = 1$; while for a couple it is $2/\mu_2^{1-\sigma}$, which is equal to 2 if $\mu_2 = 1$ and is equal to 2^{σ} if $\mu_2 = 2$.

low frequency in the HRS.[11] The nominal value of a house is given by ph, where p is the price of a unit of housing. Upon sale of the house, a homeowner receives its selling price net of any remaining debt and net of a proportional transaction cost κ. In addition, a homeowner pays every period a proportional maintenance cost δ.

Unlike owners, renters can move from one rental property to another at no moving cost. Therefore, a renter chooses the quantity of housing services consumed h at every period. All rental contracts are for one period, and the per-period rental rate, *i.e.* the proportion of the house value ph that is paid as rent, is given by:

$$r_h = r + \delta, \tag{2}$$

where r is the market interest rate. The rental rate reflects the competitive cost to a landlord of holding a house and renting it out.

4.3 Income, saving and borrowing

The non-financial income of a household is given by $\psi_s y$, where y is the pension income, which changes across households but not over time, and ψ_s adjusts it according to the number of adults in the household. In addition, households can save at an interest rate r, and homeowners can borrow against the value of their house at a rate $r + \xi$, where ξ is the mortgage premium. The value of the house sets the borrowing limit, which is defined by:

$$a \geq -(1 - \lambda_i)hp, \tag{3}$$

11 Table 2 shows that this is not the case in the DHS dataset since own-to-own moves are more popular than own-to-rent moves. However, note that here we are describing the NT model as presented in Nakajima and Telyukova (2011).

where a denotes the stock of financial wealth and λ_i determines the share of housing wealth that can be borrowed against, which NT allow to vary with age (hence the subscript i) to capture age-specific variation in the costs of borrowing against housing wealth.

4.4 Health, mortality and medical expenditures

The health status of a household is denoted by $m \in \{0, 1, 2, \ldots, M\}$, where $m = 0$ represents the death of the household. Different from De Nardi *et al*. (2010), in the NT model the health status does not affect the marginal utility of consumption. NT assume that m follows a firstorder Markov process in which $\pi^m_{i,m,m'}$ denotes the transition probability from a health state m to a health state m', which is dependent on the present health state and the age of the household, i. In addition, at any period a household can transit from $s = 2$ to $s = 1$, which captures the death of a spouse. NT assume away divorces and remarriages due to their low frequency in HRS. Household size transition probabilities from s to s' are given by $\pi^s_{i,s,s'}$.[12] These transition probabilities imply that one spouse can die first via a stochastic shock to s, or both spouses can die at the same time via the household-wide mortality shock, the probability of which is given by $\pi^m_{i,m,0}$.

The inclusion of the health status in the model allows defining the probability of incurring out-of-pocket medical expenditures (OPME). Realized OPME are denoted by x, and the probability that a given x is drawn is denoted by $\pi^x_{i,m,x}$, which is dependent on age and health status. The way medical expenditures are modelled may imply that, because of a large OPME shock, a household is forced to have negative consumption. Therefore, NT introduce a

12 By assumption, $\pi^s_{i,1,1}=1$ and $\pi^s_{i,1,2}=0$ for all i.

consumption floor guaranteed by the government and denoted by $\underline{c}$. This government-provided insurance is means-tested, which implies that consumption by each household member is subsidized up to a level $\underline{c}$ only after the household sells all of its assets and chooses the minimum rental property available.

4.5 Household problem

Households choose consumption, saving, and housing such as to maximize present and future utility flows. The latter are discounted by the rate of time preference, β, and the probability of survival. Furthermore, for all future periods, households weigh the discounted utility of bequests with the probability of death. In addition, couples take into account the possibility of a transition to a one-person household by weighing both possible future scenarios (remaining a couple or becoming a single household) by its respective probability.

For the case of a household that rents the house it occupies, utility is maximized subject to the following restrictions:

$$\tilde{c} + a' + r_h hp + x = (1 + r)a + \psi_s y, \tag{4}$$

$$c = \begin{cases} \max\{s\underline{c}, \tilde{c}\} & \text{if } a' = 0 \text{ and } h = h_1 \\ \tilde{c} & \text{otherwise,} \end{cases} \tag{5}$$

$$p' = (1 + g)p, \tag{6}$$

where a prime is used to denote a variable in the next period. Equation (4) is the periodic budget restriction; equation (5) introduces the consumption floor, where h_1 is the smallest rental property available; and equation (6) provides the evolution of house prices, where g is the house price growth rate.

The maximization problem of a homeowner consists of a choice between staying in the current house or becoming a renter. The homeowner will choose at any point in time the option that provides the higher flow of current and future utility. A homeowner who chooses to sell the house and become a renter maximizes utility subject to (5), (6) and

$$\tilde{c} + a' + x + (\kappa + \delta)hp = hp + (1 + \bar{r})a + \psi_S y, \tag{7}$$

$$\bar{r} = \begin{cases} r & \text{if } a' \geq 0 \\ r + \xi & \text{if } a' \leq 0. \end{cases} \tag{8}$$

The budget constraint (7) does not include the rental cost since the household is still a homeowner in the current period, but it includes the proceeds from the sale of the house net of the maintenance cost δ and of the transaction cost κ. Equation (8) shows that the interest rate differs depending on whether a homeowner is a saver or a borrower. Upon sale of the house, a homeowner can still be left with a debt. However, once the homeowner becomes a renter the borrowing constraint (3) turns into $a \geq 0$.

Finally, a homeowner who does not move maximizes utility subject to (3), (6), (8) and

$$c + a' + x + \delta hp = (1 + \bar{r})a + \psi_S y. \tag{9}$$

In this case there is no access to the consumption floor since the homeowner decides not to sell the house, which is a necessary condition to benefit from it.

4.6 Estimation and Results

NT estimate the model in two steps. First, they calibrate the parameters that can be identified without explicitly using the model. These are defined in the vector $\Theta = (\mu_2, \psi_2, \delta, \kappa, r, \xi, g)$. In addition, in the first step they compute the health status and household structure transition probabilities, as well as the probability of incurring medical expenditures, *i.e.* $\chi = (\pi^m_{i,m,m'}, \pi^s_{i,s,s'}, \pi^x_{i,m,x})$. In the second step, they use the method of simulated moments to estimate the rest of the parameters in the model, *i.e.* $\Upsilon = (\beta, \eta, \sigma, \omega_1, \gamma, \zeta, \underline{c}, \lambda_i)$. The latter are estimated such as to provide the best match between the model and several moments in a sample of three HRS cohorts (those of age 65, 75, and 85 in 1996), which are followed over time between 1996 and 2006. The targets are homeownership rate profiles, life cycle profiles of median total, financial and housing assets, proportion of households with debt, median debt of debtors, and median net worth profiles for homeowners and renters separately.

Once the model is estimated, NT investigate the role of several model features on the saving behavior of retirees. They do so by shutting down each mechanism one at a time and comparing the outcome to the benchmark model. The mechanisms they consider are the following: bequest motive, medical expenses, extra utility from homeownership, collateral constraints, and the housing boom of 1996–2006. The results show that leading motivators for homeownership in retirement are the bequest motive and the utility benefits of homeownership. Upon shutting down the bequest motive, *i.e.* setting $\gamma = 0$, NT observe considerably faster declines in homeownership and net worth of homeowners compared to the benchmark. The net worth withdrawal rate of renters is also increased, but less than that of homeowners.

Similar results are found for homeowners when the utility benefits of homeownership are shut off, *i.e.* $\omega_1 = \omega_0 = 1$.[13]

Another key feature of the results is that there appears to be potential demand for housing equity loans and reverse mortgages. Regardless of the importance of the bequest motive and of the utility benefit of homeownership, owner-occupiers react to a lower λ_i by increasing their debt somewhat through housing equity loans. However, due to tight borrowing conditions that apply in practice, many older households are unable to liquidate their housing. In addition to this result, by manipulating the value of g, NT find that the housing price boom in the US, although it increased housing equity borrowing somewhat, contributed substantially to the low net worth withdrawal rate among homeowners. Finally, NT find a rather modest effect of OPME. They do find that when setting $x = 0$, the youngest retirees shift towards a slightly faster decline in their net worth. However, the effect is almost negligible for older retirees.

In summary, NT find that housing interacts with factors that solve the RSP, notably with the bequest motive. In addition, homeownership decreases the net worth withdrawal rate through the utility benefits it provides and the high costs of housing equity borrowing. On the other hand, OPME do not seem to play a major role in explaining homeownership late in life. These results differ substantially from those in De Nardi *et al*. (2010), who find an insignificant bequest motive and a larger role for OPME. There are several potential explanations for these differences. First, De Nardi *et al*. (2010) do not consider housing

13 The utility benefits of homeownership capture factors such as attachment to one's house and neighborhood and the ability to adapt the house to personal tastes. Furthermore, they capture financial benefits of ownership that are not explicit in the model, *e.g*. tax exemption of imputed rents, mortgage interest payment deduction, and insurance against rental rate fluctuation.

as a separate portfolio element and thus they do not match the evolution of homeownership and housing wealth when estimating their parameters. In the work of NT, matching these facts clearly emphasizes the role of bequests and of the utility benefits of homeownership. Second, De Nardi *et al*. (2010) employ data on singles who, arguably, are less prone to have a bequest motive than couples. Couples are more likely to have children and also more likely to be wealthier, both of which are facts that potentially lead to a stronger bequest motive. Third, De Nardi *et al*. (2010) consider that the worsening of the health status has a negative effect on the marginal utility of consumption, while NT do not. Was this feature included in the NT model, it could easily compete with the bequest motive in explaining the HRS wealth profiles. However, it is not entirely clear what the outcome would be.

5. Homeownership and the bequest motive

The correlation between homeownership and the bequest motive pointed out by NT serves as a link between the two streams of literature discussed in Sections 2 and 3, and has potentially relevant implications for the understanding of the retirement-savings puzzle (RSP). Table 4 shows how in a sample of DHS households running from 2005 to 2014, homeownership is clearly associated with the bequest motive. Households are asked about the importance to save for leaving a house and/or other assets to their children and, as well, about the importance of saving to leave a bequest in the form of money. In both cases they are asked to rank the importance from 1 (not important at all) to 7 (very important). Additionally, households are asked what is the chance that they leave a bequest. In all cases, homeowners seem more inclined than renters to leave a bequest, which, as Table 4 shows, holds when considering both the mean and median of the responses' distribution. The relationship between homeownership and bequests becomes even more clear when only older households are considered.

The results of the work by NT, as well as the evidence for the Netherlands shown in Table 4, indicate that there is a correlation between homeownership and the bequest motive. However, by relying strictly on this evidence one cannot exactly say in which direction the causality runs: either from the bequest motive to homeownership or vice versa. It can be that households with a strong bequest motive decide to become homeowners so that they can bequeath a house. Conversely, it can be that, once having become homeowners, households rationalize the house as an asset to be bequeathed. Furthermore, it can be that there is a

Table 4. Importance of the bequest motive by housing tenure (2005–2014)

		Homeowners		N. of	Renters		N. of
		Mean	Median	obs.	Mean	Median	obs.
Importance of saving for a bequest (1)	Full sample	3.09	3	8,597	2.43	2	3,335
	Older adults	3.35	3	3,698	2.41	2	1,418
Importance of saving for a bequest (2)	Full sample	3.11	3	8,889	2.62	2	3,545
	Older adults	3.36	3	3,808	2.63	2	1,517
Chance of leaving a bequest	Full sample	82.76	100	9,446	49.83	50	3,968
	Older adults	84.53	100	4,021	40.83	25	1,670

Source: DHS. Older households are defined as households with a household head who is 60 or older. The importance of saving for a bequest is measured on a scale from 1 (not important at all) to 7 (very important). In (1), households rank the importance of saving "to leave a house and/or other valuable assets to your children", while in (2) they rank the importance of saving "to leave money to your children (or other relatives)". Chance of leaving a bequest is measured on a scale from 0 (no chance) to 100 (100% chance).

third variable, for instance lifetime income, that would explain both homeownership and bequests simultaneously.

To briefly check for the role of lifetime income as a confounding factor, Table 5 provides, next to the bivariate correlation between homeownership and the different measures of the bequest motive, the corresponding partial correlations keeping fixed the average over time of household income. The latter is used here as a proxy for lifetime income. The latter are the correlations that would be observed if average income did not vary. Additionally, the last column provides the *p*–values associated with the partial

correlations.[14] A comparison of the first and second columns illustrates that keeping average income constant slightly decreases the correlation between homeownership and bequests. However, the correlation coefficients remain positive and, as the last column in the table shows, all partial correlations are highly significant. These results suggest that income is not the explanation, or at least not the only explanation, for the correlations observed in Table 4. This holds both when using the entire sample and when only focusing on older adults. Note that for the latter, average household income is more likely to be a good proxy for lifetime income, since, compared to labor income, pension income is considered to be a better proxy for lifetime income.[15]

The results of the work by NT, as well as the evidence for the Netherlands shown in Tables 4 and 5, suggest that an important reason why housing is held throughout retirement is because it is viewed as an asset to be bequeathed. Even though we cannot make any firm statement about the direction of causality at this stage, it is clear in any case that homeownership is an element to consider when studying bequests. This insight has

14 Partial correlations are obtained by fitting regressions of each of the measures of the bequest motive on homeownership and household income. The coefficient is then computed as $t/\sqrt{t^2+n-k}$, where t is the t-statistic, n is the number of observations, and k is the number of explanatory variables in the regression. The p-values are given by $2Pr(t_{n-k} > |t|)$, where t_{n-k} follows a student's t distribution with $n-k$ degrees of freedom. Partial correlation does not make an assumption about the direction of causality. Therefore, the outcome would be the same if, in the regressions, homeownership was used as dependent variable and the bequest motive as explanatory variable. For more information on partial correlation, see Greene (2012).

15 As explained in Knoef *et al.* (2013), in the Netherlands pension income reflects, to some extent, the level of income earned throughout the working life of an individual. Furthermore, they assert that pension income represents a major share of the income of retirees, that the variance of income shocks is smaller for retirees than for working people, and that income shocks are more persistent for retirees. For all these reasons, Knoef *et al.* (2013) argue that pension income especially is a good proxy for lifetime income.

Table 5. Correlation between homeownership and bequests (2005–2014)

		Correlation	Partial correlation	*p*-value
Importance of saving for a bequest (1)	Full sample	0.180	0.140	0.000
	Older adults	0.251	0.208	0.000
Importance of saving for a bequest (2)	Full sample	0.135	0.090	0.000
	Older adults	0.195	0.150	0.000
Chance of leaving a bequest	Full sample	0.424	0.351	0.000
	Older adults	0.532	0.458	0.000

Source: DHS. Older households are defined as households with a household head who is 60 or older. The importance of saving for a bequest is measured on a scale from 1 (not important at all) to 7 (very important). In (1), households rank the importance of saving "to leave a house and/or other valuable assets to your children", while in (2) they rank the importance of saving "to leave money to your children (or other relatives)". Chance of leaving a bequest is measured on a scale from 0 (no chance) to 100 (100% chance). The first column shows the bivariate correlation between the different measures of the bequest motive and homeownership. The second column shows partial correlations which keep the influence of average household income on homeownership and bequests constant. The third column shows the significance of the partial correlations.

relevant implications for understanding the RSP, especially in the Netherlands, where due to public coverage of long-term expenses, precautionary saving is unlikely to play a role. Davidoff (2010) suggests that in the US, older homeowners do not liquidate housing equity because they use it as long-term care insurance. However, in the Netherlands there is public coverage of long-term care expenses. Nevertheless, as shown by De Graaf and Rouwendal (2012) and Van Ooijen *et al*. (2015) among others, older homeowners still do not decumulate their housing equity, which opens the door to consider bequests as an important factor. This idea is supported by the evidence provided by Dillingh *et al*. (2015), who find that, among homeowners, both having children and the willingness to leave a bequest have a strong negative impact on interest in reverse mortgages.

6. Alternative bequest motives

There are several possible reasons why households would prefer to leave a bequest in the form of a house rather than doing it in the form of cash. NT suggest that, because there are extra utility benefits of homeownership, households who want to accumulate assets in retirement due to a bequest motive prefer to do so in the form of a house. Furthermore, they point to the fact that due to the transaction costs associated with liquidating housing equity, it is convenient for older homeowners to stick to their housing when saving for a bequest rather than opting for more liquid alternatives. There are, however, alternative ways of modelling bequests that provide insights on why saving for a bequest in the form of a house yields extra benefits compared to other alternatives. In this section, we review these alternative bequest motives in order to better grasp this issue.

6.1 Altruistic bequests

Following previous work such as that by Hurd (1989) and Kopczuk and Lupton (2007), NT model the bequest motive as an egoistic motive, implying that bequests are generated strictly by the desire of individuals to have positive net worth upon death, *i.e.* their aim to be the richest in the cemetery. The egoistic motive is thus independent of the economic situation of the heirs, and it can apply even when a household has no heirs.

As an alternative to the egoistic motive, Laitner (2002) proposes a model in which the bequest function depends on the consumption possibilities of the heirs. This idea originated from earlier work by Barro (1974) and Becker (1974), and, in its simplest form, it consists of rewriting the within period utility in the NT model as follows:

$$V^P = u(c, h, o; s) + \alpha V^K(b), \tag{10}$$

where $V^P(\cdot)$ is the utility function of the parents and $V^K(\cdot)$ the utility function of the heirs. The first element in (10) is identical to that in Equation (1), whereas the second element substitutes the bequest motive in the NT model by $\alpha V^K(b)$, where α indicates to what extent a household cares about its heirs. The size of the bequest influences the lifetime income of the recipient and thus has a positive effect on the recipient's utility, *i.e.* $\partial V^K(b)/\partial b > 0$. However, the higher the lifetime income of the recipient, the lower the marginal utility of additional bequeathed wealth. Therefore, if the heirs already have a high lifetime income without considering the bequest, the amount bequeathed is likely to be comparatively small.

Employing a survey of US pension holders, Laitner and Juster (1996) find that willingness to leave a bequest is higher for households with the lowest assessment of their children's likely earnings. In addition, Laitner and Ohlsson (2001) find evidence of parental altruism in Sweden and the US. However, this evidence contradicts with the work by Altonji *et al*. (1997) and Poterba (2001), who find that, in the US, parents do not modify inter vivos transfers in response to changes in their children's permanent income. In addition, Kopczuk and Lupton (2007), who employ panel data on singles from the AHEAD survey, make a case against the altruistic model by showing that there are households who save for a bequest without having children, leading them to argue that children and bequests are independent of each other. However, we must note that altruism is not necessarily only towards children. There can be as well altruism towards other relatives and/or towards non-relatives.

Table 6. Correlation between having children and the bequest motive (2005–2014)

Homeowners		Children Mean	Median	N. of obs.	No children Mean	Median	N. of obs.
Importance of saving for a bequest (1)	Full sample	3.38	3	6,747	1.83	1	1,485
	Older adults	3.50	4	3,329	1.67	1	297
Importance of saving for a bequest (2)	Full sample	3.41	3	6,812	1.95	1	1,711
	Older adults	3.51	4	3,379	1.92	1	356
Chance of leaving a bequest	Full sample	82.35	100	7,136	81.62	99	2,310
	Older adults	83.98	100	3,501	81.88	100	520
Renters		**Children Mean**	**Median**	**N. of obs.**	**No children Mean**	**Median**	**N. of obs.**
Importance of saving for a bequest (1)	Full sample	2.69	2	2,035	1.90	1	1,097
	Older adults	2.51	2	1,195	1.65	1	176
Importance of saving for a bequest (2)	Full sample	2.96	2	2,127	2.03	1	1,215
	Older adults	2.79	2	1,269	1.56	1	200
Chance of leaving a bequest	Full sample	42.35	25	2,312	62.44	80	1,656
	Older adults	39.70	20	1,369	52.05	50	301

Source: DHS. Older households are defined as households with a household head who is 60 or older. The importance of saving for a bequest is measured on a scale from 1 (not important at all) to 7 (very important). In (1), households rank the importance of saving "to leave a house and/or other valuable assets to your children", while in (2) they rank the importance of saving "to leave money to your children (or other relatives)". Chance of leaving a bequest is measured on a scale from 0 (no chance) to 100 (100% chance).

Table 6 shows that, according to DHS data, Dutch older households with children assign higher importance to saving for a bequest. This difference is clearest when only homeowners are considered. Considering only altruism towards children, *i.e.* leaving out altruism towards other (non)relatives, this descriptive

result suggests that the altruistic model is likely to apply in the Dutch case. However, regarding the chance of leaving a bequest, having children does not seem to play such an important role. In fact, among renters, those with children report a higher chance of leaving a bequest compared to those without children.

Among homeowners, there does not seem to be a difference between households with children and households without. Nevertheless, note that the importance of saving for a bequest is not the same as the chance of actually leaving a bequest. Comparing homeowners and renters, Table 6 confirms the strong correlation between homeownership and the bequest motive already observed in Tables 4 and 5.

Even though in general the evidence appears to be mixed, the altruistic model should not be dismissed since it has important implications for understanding the rationale behind the bequest motive, as well as for understanding how wealth inequality is transferred from one generation to the next. In addition, as will become clear below, the altruistic model can help explain the interaction between homeownership and the bequest motive that stems from the NT model.

6.2 Strategic bequests

A different approach to the bequest motive was introduced by the early work of Bernheim *et al*. (1985), who suggest that bequests are generated in a context of intergenerational exchange. In this context, parents are still altruistic in that they care about the utility of their heirs. However, at the same time, they also care about the services provided to them by their children. Consequently, they try to strategically influence their children's actions in their favor by using the bequest as an incentive. In the strategic model, it makes sense to separate housing from the

other elements of the household portfolio, since it is an asset that parents can easily use to signal a reward for their children's services. In that way, the strategic model can help to better understand the interaction between homeownership and the retirement–savings puzzle (RSP).

In a very stylized way, strategic bequests can be introduced in the NT model by modifying the within-period-utility of the altruistic version of the model, given by Equation (10), as follows:

$$V^P = u(c, h, o, \tau\,; s) + \alpha V^K(b, \tau), \tag{11}$$

where τ denotes the services provided by the children to their parents, which increase parental utility, *i.e.* $\partial u(\cdot)/\partial\tau > 0$ but affect the utility of the children negatively, *i.e.* $\partial V^K(b, \tau)/\partial\tau < 0$. In Bernheim *et al.*'s model, the household commits itself to a bequest rule. The latter specifies the fraction of the bequest given to each recipient for each amount of services provided, and it establishes that a descendant will be disinherited in favor of other recipients if he or she does not contribute with a minimum amount of services. For the rule to be convincing, parents must be credibly committed to retain enough wealth for bequest purposes. This can be done by holding wealth in illiquid form such as housing equity. If transactions costs are high and financial products to liquidate housing are hardly available, holding onto a house can be a way for older adults to signal a future bequest to the heirs.

The empirical literature on the strategic model generally follows an approach that consists of regressing the number of visits by the heirs to the parents on parental wealth. The main challenge is to take into account the endogeneity of parental wealth, since, if strategic behavior applies, parents will increase their wealth

holdings in response to increased attention. Furthermore, there may be unobserved factors that affect both parental wealth and the number of contacts. The literature generally tackles this issue by instrumenting for wealth. Bernheim *et al*. (1985) instrument wealth with lifetime earnings and, based on US data, find evidence that supports the altruistic model. Perozek (1998) instruments with an index that maps occupations into a socio-economic ranking and controls for additional individual and family characteristics. Using a different US dataset, he claims that the results by Bernheim *et al*. are not entirely robust. On the other hand, Angelini (2007) uses the educational level and the number of rooms in the parental house as instruments. Using data on several European countries she finds empirical support for the strategic model. The effect appears to be strongest when using illiquid forms of wealth, such as housing, as explanatory variable. This finding suggests that housing is used as a strategic bequest, and it helps understand the interaction between homeownership and bequests observed by NT.

Table 7 shows that, according to DHS data, the strategic motive is not very popular among Dutch households. Homeowners who are above 65 years of age appear to be the most inclined to use bequests strategically. However, only 3.84% of them report a strategic bequest motive.[16] There are three caveats to keep in mind when using these data. First, the majority of house- holds, especially homeowners, report not having any preconceived bequest plans; second, households may be inclined towards

16 Note that the higher share of old homeowners reporting a strategic bequest motive compared to the full sample may simply reflect the fact that older households are more likely to have plans about the use of their net worth. In any case, when observing both the full sample and older households, the share of respondents who report a strategic bequest motive is always rather low.

Table 7. Presence of strategic and altruistic bequest motives (2005–2014)

	Full sample		Older households	
	Homeowners	Renters	Homeowners	Renters
(1) Strategic bequest	3.46%	1.29%	3.84%	1.75%
(2) Altruistic bequest	22.32%	8.97%	31.01%	8.87%
(3) No explicit plans about bequests	66.03%	53.68%	57.33%	50.52%
(4) No bequest	1.56%	6.62%	1.47%	8.18%
(5) None of the above	6.63%	29.44%	6.35%	30.67%
Number of observations	7135	2311	2529	1045

Source: DHS. Conditional on having children, respondents are asked which statement best reflects their opinion: (1) leaving a bequest if children provide services; (2) leaving a bequest regardless of services provided; (3) no explicit plans about leaving a bequest; (4) no intention to leave a bequest; (5) none of the above. Older households are defined as households with a household head who is 60 or older.

reporting altruistic bequests to hide their self-indulgence; and, third, those willing to leave a bequest regardless of the services provided might be willing to increase it if services are actually provided. These are all arguments suggesting that strategic bequests may be more important than as reflected in Table 7. In any case, Table 7 shows that both strategic and altruistic bequest motives are present, and that they are more popular among homeowners than among renters.

7. Housing as a commitment device

An additional complement to the NT model that might shed light on how housing equity during retirement can help solve the retirement-savings puzzle (RSP) is provided by the literature on temptation and self-control. In two seminal contributions to this literature, Gul and Pesendorfer (2001, 2004) develop a model in which an agent chooses between different sets of alternatives for consumption, some of which contain a tempting good. The latter is a good that the agent may crave; however, consuming it represents a sub-optimal choice. If the agent chooses the set of alternatives that contains the tempting good, he or she will either consume it or exert self-control to not do so, which comes at a utility cost. A different option consists of choosing a set of alternatives that excludes the temptation good and thus commits the agent to not choosing it. This option saves the cost of self-control.

The model by Gul and Pesendorfer has been applied tovarious fields within economics. There is a recently emerging literature (*e.g.* Angelini *et al.*, 2013; Kovacs, 2014; and Ghent, 2015) that applies it to the study of housing demand over the life cycle. This literature points out the role of housing as a commitment device. The idea is that if immediate consumption is a temptation good, households will suboptimally choose to consume too much in the present and will not save enough for retirement. In this context, households can commit themselves to save by investing their wealth in housing. This feature can be incorporated in the NT model of Section 4.1.1 by rewriting the utility function as follows:

$$V = u(c, h, o; s) - \rho(v(c^*, h, 0; s) - u(c, h, o; s)), \tag{12}$$

where for simplicity we have excluded the bequest motive. The second element in (12) is the temptation term, which is weighted by ρ, and where $v(\cdot)$ is the level of utility attained when all wealth is liquidated, the household is a renter ($o = 0$), and consumption is set to its maximum immediate level, c^*. If the household chooses this utility level, the temptation term cancels out. Otherwise, the temptation term is assumed to be positive, *i.e.* $u(\cdot) < v(\cdot)$ *if* $c < c^*$, and it can be seen as the utility cost of self-control, since it provides the utility difference between the tempting alternative and the actual choice.

To increase lifetime utility, a household should save for the future but at the same time reduce the cost of self-control. This is possible by investing in illiquid assets, which will reduce the wealth disposable for immediate consumption and, in turn, reduce the cost of self-control. Housing can play this role, since its liquidation usually implies high transaction costs and financial instruments to liquidate housing equity are not always readily available. The temptation motive has the potential of explaining the interaction between homeownership and altruistic or strategic bequests. If, in the presence of immediate consumption as a tempting alternative, one wants to make sure that a bequest is left for the following generation, using housing as a commitment device can come in handy, especially if one wants to strategically signal that a bequest will come.

To test the temptation motive for housing, Angelini *et al*. (2013) use European life history data and regress the hazard rate of homeownership, *i.e*. the probability that a renter will transit to homeownership, on the value of liquid and illiquid financial assets in the household portfolio. They find a considerable effect of holding illiquid financial assets, especially strong for individuals above forty years of age. As the authors argue, the latter are

the most likely to transit into homeownership for commitment purposes, since earlier in life the purchase of a house is more likely related to family formation. On the other hand, Kovacs (2014) follows a different approach, consisting of estimating a structural life cycle model with temptation preferences. Her model predicts that the interaction between housing services in the utility function and temptation preferences induces a high demand for housing as a commitment device. Housing demand appears to be about 30% higher at its peak over the life cycle when housing plays a commitment role compared to when it does not.

Table 8 shows that about 40% of the rent-to-own transitions registered in the DHS dataset correspond to households with a household head who is forty years of age or more. Even though these moves might be linked to events such as marriage, divorce or increase in family size, Angelini *et. al*. (2013) point out that rent-to-own transitions that take place above forty are more likely to be for commitment purposes than those that take place below that age. In addition, the lower panel of Table 8 shows that, when considering the whole DHS sample between 2005 and 2014, remaining mortgage debt is still relatively high for households who are above 60. This suggests that a reasonable percentage of households are likely to have become homeowners (or to have increased the size of their property) late in life.

Summarizing, Table 8 indicates that commitment demand for housing is a relevant possibility in the Netherlands. However, a note of caution is in place here since the evidence is very descriptive and a more in-depth study is needed to elucidate the

Table 8. Rent-to-own moves and remaining mortgage debt (RMD) (2005-2014)

		Below 40	40-50	50-60	60-70	70+	Total
Rent-to-own	Number	115	51	15	5	4	190
moves	%	60.53%	26.84%	7.89%	2.63%	2.11%	100%
RMD	% with RMD	19.34%	25.90%	29.71%	29.18%	23.03%	25.26%
	Average	37.63	41.44	38.67	33.26	21.16	34.99

Source: DHS. Average RMD is provided in thousands. The last column of the RMD panel provides the percentage of households with RMD and the average RMD when all ages are pooled together. Renters are included when calculating statistics regarding RMD.

true relevance of the use of housing as a commitment device.[17] For example, the fact that even older homeowners still hold mortgage debt may be due to the tax deductibility of mortgage interest and/or the popularity of interest-only mortgages. Therefore, any future study on this topic should take these factors into account as well. Nevertheless, the evidence reported here does not rule out the fact that, in combination with the descriptive evidence on the relationship between homeownership and bequests, the commitment demand for housing potentially adds to the understanding of the RSP in the Netherlands.

17 To bring the analysis a step further, we have checked whether answers to the DHS question "Do you find it easy or difficult to control your expenditures?" correlate with housing tenure. We find that the correlation coefficient is very close to zero. However, a more in-depth analysis is required to clarify whether housing is used as a commitment device.

8. Conclusion

A full understanding of the underlying causes behind the retirement-savings puzzle (RSP) is crucial for an assessment of the adequacy of retirement savings in the context of pension system reforms. To that end, we complement the RSP literature by reviewing the literature on housing equity during retirement (HER). The HER literature indicates that retirees are generally reluctant to withdraw their housing equity, which has clear implications for the understanding of the RSP. This insight is picked up by Nakajima and Telyukova (2011), who develop a model of the retirement savings of couples with housing. One of their main conclusions is that housing as a bequeathable asset plays a major role in solving the RSP. Further literature on altruistic and strategic bequests, as well as on housing as a commitment device, provide additional insights to understand the connection between bequests, homeownership, and the RSP.

The descriptive evidence that we draw from the Dutch National Bank Household Survey (DHS) shows that a vast majority of Dutch homeowners do not sell their house to finance their retirement, and that it is likely that homeownership among retirees will increase in the near future due to cohort effects. More interestingly, the evidence shows that there is a strong correlation between homeownership and the importance given to leave a bequest, as well as between homeownership and the self-perceived chance that a bequest will be left. Even though the evidence that we have provided here does not allow us to take a stand on the direction in which the causality runs, *i.e.* either from the bequest motive to homeownership or vice versa, it is clear that any future study on bequests must take the relevance of housing into account. Leaving housing out of the picture may seriously

underestimate the bequest motive for those households that view their housing equity as the main element to be bequeathed.

The RSP literature is still a fertile ground for new contributions. Structural models in the line of De Nardi *et al*. (2010) and Nakajima and Telyukova (2011), as well as reduced form type of analysis, can bring on a better understanding of the connection between homeownership, bequests, and the RSP. In addition, the literature on strategic bequests as well as the literature on temptation and commitment provide potentially fruitful lines of research for the further understanding of the stylized facts laid out in this survey paper.

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The role of housing as a bequeathable asset

The so-called retirement-savings puzzle is a phenomenon by which, contrary to what the basic life-cycle model predicts, households do not run down their wealth significantly during retirement. In this survey paper Eduard Suari-Andreu, Rob Alessie and Viola Angelini (all RUG) briefly review the literature that attempts to solve the retirement savings puzzle. In addition, they review more extensively the literature on housing equity during retirement. This paper contains important policy recommendations on this subject.

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